



Fall 2016





**Twin City Lines is published
quarterly by the
Minnesota Streetcar Museum**

P. O. Box 16509
Minneapolis, MN 55416-0509
(952) 922-1096
www.trolleyride.org

Vol. 10 No. 4

Aaron Isaacs, Editor
3816 Vincent Avenue South
Minneapolis, MN 55410
612-929-7066
aaronmona@aol.com

Twin City Lines is published quarterly and is mailed to members in good standing without charge under Third Class postal permit.

The Minnesota Streetcar Museum operates the Como-Harriet Streetcar Line in Minneapolis and the Excelsior Streetcar Line in Excelsior. Its mission is to preserve Minnesota's electric railway heritage.

**BOARD OF DIRECTORS
and OFFICERS**

Chair	Aaron Isaacs
Vice-Chair	Dave French
Secretary	James A. Vaitkunas
	Bob Bayers
John Dillery	Ben Franske
Karen Kertzman	Darel Leipold
Holly Wetzel	Joe Young

Bruce Gustafson, General Superintendent

Todd Bender, Excelsior Superintendent

Keith Anderson, Treasurer



St. Paul's cable cars

-Aaron Isaacs

As the 19th century progressed and cities expanded, transit operators searched for a mechanized replacement for horse drawn streetcars. Horse cars were slow, averaging 5 mph or less. Horses tired, requiring teams to be replaced several times a day. They got sick, suffered injuries and deposited huge amounts of manure on the street.

The seemingly obvious mechanical substitute was the steam locomotive, then an off the shelf technology and the usual answer to any propulsion need. However, steam locomotives spewed hot ashes and soot, and frightened the horses on the streets. As a result, the public would not abide them and they were used sparingly on street railways, most often on suburban lines away from the city centers. The Twin Cities' primary example, the Minneapolis, Lyndale & Minnetonka, was under siege by adjacent residents from the day it opened.

Electricity was not yet practical and wouldn't be until 1888.

The bridge technology that replaced many horse cars as the electric era dawned was the cable car. It was born in San Francisco in 1873, the only city where it remains in operation today. A wire rope manufacturer named Andrew Halladie is purported to have witnessed a horse car climbing a steep hill when the horses lost their footing and were dragged backward to the bottom, where they had to be destroyed. Whether or not that is true, clearly San Francisco needed a better way to climb its many steep hills.

Cable-hauled railways were not a new idea, but Halladie put the ingredients together to create a workable streetcar. A stationary steam engine located in a powerhouse would propel a steel cable via a network of underground pulleys placed in a cast iron conduit under the center of the track. The conduit required a trench about four feet deep. The track rested on cast iron "yokes" set every 30 feet through which the cable passed on rollers. The unpowered streetcar was equipped with a grip that reached down through an iron slot between the rails to grasp the cable and be pulled along. The ability to grasp and let go of the cable made streetcar service, with all its starts and stops, possible. The cable traveled at 8-10 mph, doubling the speed of a horse car. Furthermore, it could climb any hill, no matter how steep.

Although various technical refinements were added over the years, the basic design worked from the start. Cable lines were extremely expensive to construct and costly to maintain, but for 15 years they were the best available replacement for horses.

San Francisco enthusiastically embraced the cable car, yet no other city followed suit for nine years. Cable car construction took off starting in 1885. Interestingly, this happened just as the first experimental and unsuccessful electric lines were appearing. The Sprague electric streetcar patents that solved the technical problems of electric traction first appeared in 1888, and swept the country. Electric street railways cost half as much to build and were two-three times as fast. The handwriting was on the wall. Even so,

the majority of the cable car lines were built from 1888 to 1891, although electricity was clearly superior and was simultaneously replacing most horse car lines.

Having spent a great deal to build them, and with some horse drawn and steam powered lines yet to be electrified, the cable cars hung on for a few years. Most were gone by 1900. Thereafter, most of the survivors ran on steep hills the electrics couldn't conquer. That was particularly true in San Francisco, Seattle and Tacoma. The latter two lasted to 1940 and 1938 respectively. San Francisco retained a significant network well into the 1940s, and its last three lines were rescued as civic icons and survive now for that reason. The table on the next page shows the history of cable car construction and abandonment.

St. Paul was the most northerly city with cable cars. The Selby Avenue line opened on January 21, 1888. It ran the length of 4th Street through downtown, where it replaced older horse car tracks. It passed through Seven Corners and climbed the 16 percent grade up the hill where the cathedral of St. Paul is now located. From there it traveled out Selby Avenue to St. Albans Street for a total distance of 2.5 miles. It replaced a horse car line that took a circuitous, but less steep route to the Summit Hill neighborhood via Summit Avenue, Iglehart Avenue, Western Avenue and Laurel Avenue to Dale Street. The steepest section on Summit had required "grade horses", an extra team stationed at the bottom of the hill to assist the car up the grade.

On August 24, 1890 the line was extended out Selby from St. Albans to

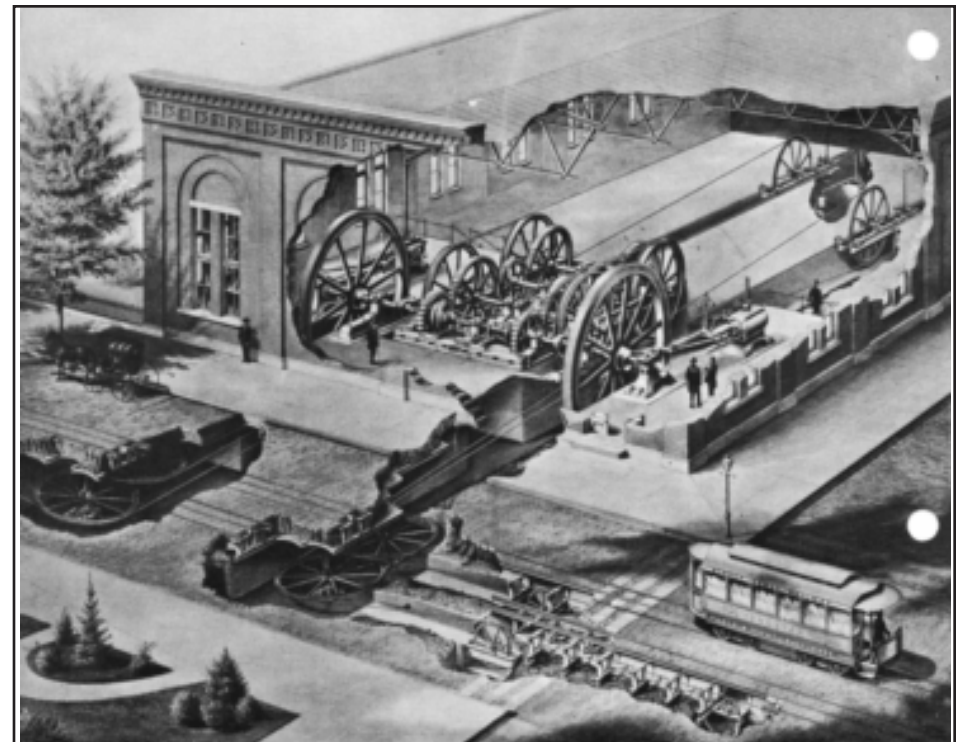
Front cover: This issue tells all about St. Paul's cable cars. The conductor mans the trailer's rear brake wheel as a cable train carefully descends the Selby Avenue hill into downtown. Minnesota Historical Society collection.

Inside front cover: For the rest of this issue we jump ahead in time to cover electric trolley buses, which appeared briefly in Minneapolis but had a much longer career in Duluth. This is the transfer between the first line, the Lester Park shuttle, to the Crosley streetcar at 45th Avenue E. and Superior Street. Note the separate sets of overhead wires.

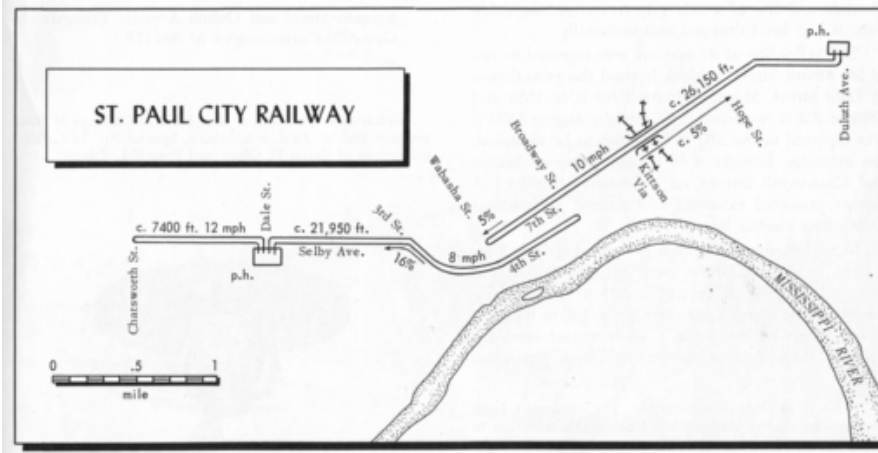
First line opened	City	Last line opened	Last line closed
1873	San Francisco	1889	N/A
1882	Chicago	1893	1906
1883	Philadelphia	1887	1895
1885	Kansas City	1889	1913
1885	Cincinnati	1888	1902
1885	New York City	1895	1901
1885	Los Angeles	1889	1902
1885	Binghamton, NY		1888
1886	Hoboken		1892
1886	St. Louis	1891	1901
1886	Oakland, CA	1892	1899
1887	Brooklyn	1891	1909
1887	Omaha	1888	1894
1888	St. Paul	1891	1898
1888	Newark, NJ		1889
1888	Grand Rapids, MI	1890	1891
1888	Pittsburgh	1890	1897
1888	Seattle	1891	1940
1888	Denver	1892	1900
1889	Butte, MT		1897
1889	Sioux City	1892	1894
1889	Spokane		1894
1890	Providence		1895
1890	Portland, OR		1904
1890	Washington, DC	1895	1899
1890	San Diego		1892
1890	Cleveland		1901
1891	Baltimore	1893	1899
1891	Tacoma		1938

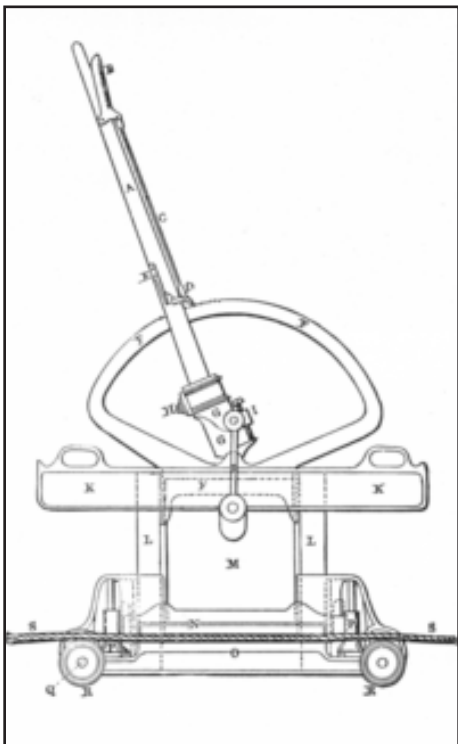


Above: The powerhouse at Selby and Dale, later converted to electric service.
Below: A generic cutaway view of a powerhouse showing the complexity of the cables, from *The Cable Car in America*, By George Hilton.

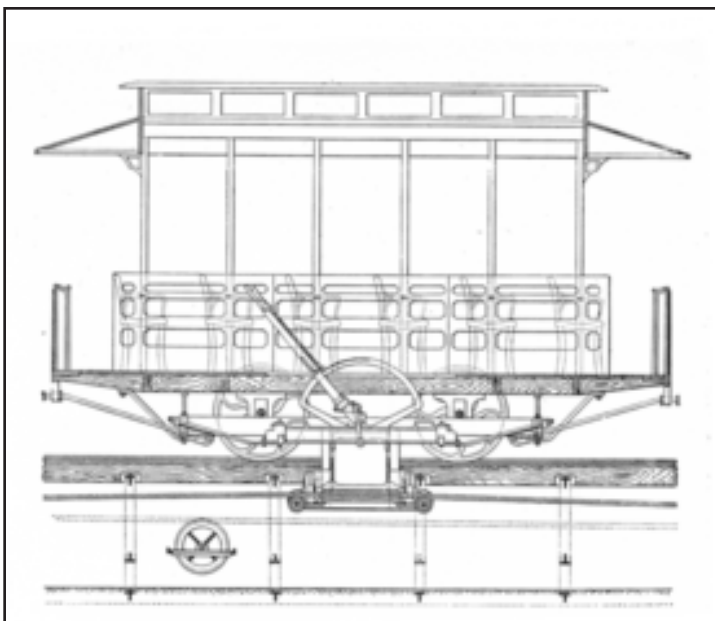


Above: The list of American cable lines and their openings and closings.
Below: The cables, power house locations and street grades, from *The Cable Car in America*, By George Hilton.





Above: Detail of the type of grip used in St. Paul, and (Below) how it fit into a typical grip car. From *The Cable Car in America*, By George Hilton.

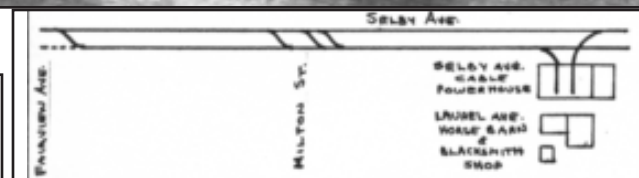
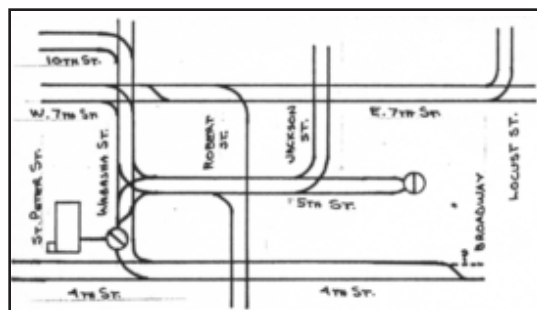


Fairview Avenue, by far the longest distance from downtown of any St. Paul line. It was the only cable extension built after electrification of the horsecars had begun. A year later TCRT changed its mind and cut back the cable cars from Fairview to Chatsworth Street on October 14, 1891. It substituted electric cars on the former cable extension, and extended that line on Fairview to Marshall Avenue to Prior Avenue to University Avenue. This was called the Merriam Park Extension, with passengers transferring to the cable cars at Selby and Chatsworth.

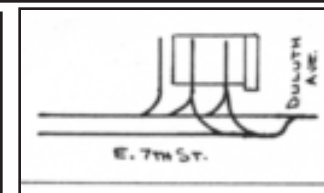
The cable powerhouse/carhouse was located near the intersection of Selby Avenue and Dale Street. The line was actually powered by two individual cables, as shown on the diagram on page 4 from *"The Cable Car in America"*, by George Hilton.

Although the cable cars were single trucked, like the horse cars they replaced, they could be run in trains with multiple trailers, giving them a

Right: A cable train passes St. Paul City Hall at 4th and Wabasha. Minnesota Historical Society collection.



Left: Track map of downtown St. Paul in the horsecar/cable era. Above: The Selby line. Right: East end of the E. 7th Street cable line.



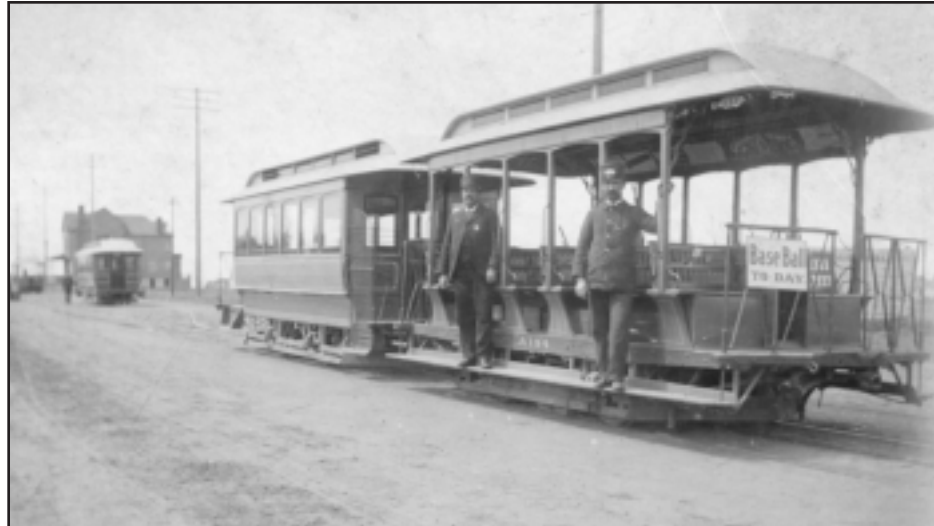
much greater capacity. Most of the available photos show an open grip car, pulling either a single open or closed trailer, but there is one showing two trailers on page 7.

A second cable line opened June 14, 1889. It ran on East 7th Street from Wabasha Street in the center of downtown to Duluth Street and replaced a horsecar line built in 1884 and 1886. On the way it climbed a mile-long 5 percent grade. The powerhouse/carhouse was located at Duluth Street, where it eventually connected end-to-end with the steam powered North St. Paul Railroad, which arrived in April 1890.

East 7th Street was shared with the Lafayette Avenue horsecar line for about a mile from downtown to the junction at Locust Street (now Lafayette Road) where they diverged. The cable cars towed the horsecars until they reached their own rails and horses were added. This saved money on horses and crew and prevented conflicts with the slower horsecars from delaying the cable cars. The only problem was the connection in the westbound direction, which was unreliable, causing delays to both lines. This situation only lasted for about a year, until the Lafayette line was electrified and thereafter ran through to downtown.

The two cable lines paralleled each other through downtown but did not connect. Between them in 1893 they rostered 38 open grip cars, 34 closed trailers and 32 open trailers. In 1894-95, enclosures were added to the grip cars to comply with Minnesota's 1892 law requiring vestibules to protect streetcar crews from winter cold.

The East 7th Street cable line was electrified on Sept. 1, 1893. This allowed the connecting Maria Avenue line to run through to downtown.



Above: The only known photo of the western terminal at Selby and Chatsworth. Note the crossover track.

Below: Looking down the Selby hill. Minnesota Historical Society collection.



Previously all passengers had to transfer to the cable cars to complete their trip. The powerhouse at Duluth Street was electrified at the same time and renamed East 7th Street Station. The cable cars that ran on East 7th Street became surplus. The trailers were reassigned to the electric lines and pulled behind motor cars.

The Merriam Park electric cars continued to feed the Selby Avenue cable cars at Chatsworth until 1898, when the decision was made to electrify the cable line. Of course there was still the challenge of climbing the 16 percent grade at the west edge of downtown. The solution was to convert the hill to a counterweight system.

Rules for Gripmen

In the MSM collection is a St. Paul City Railway rulebook from 1888. It contains a section on gripmen, giving us a window on what it was like to run a cable car.

Gripmen's Equipment.

1. Each Gripman will be furnished with the following tools which must always be kept on the car or in tool box: Grip hook, monkey wrench, screw driver, adjusting pin, hammer, cold chisel, and oil can.

These articles will be charged to him, and unless worn out by use, will be paid for by him. Unless returned when leaving the service of the Company, full price will be charged for them.

Badges.

2. Gripmen having badges will turn in the same at Superintendent's or Foreman's office immediately after being discharged, resigning or leaving the employ of the Company.

Always wear badge when on duty, and keep it bright and clean.

Adjusting Grip.

3. Gripmen will see that their grip is kept in proper condition and adjustment. The top die adjustment must be kept at the proper point to admit of the greatest leverage power, being careful to keep the lever far enough ahead of centre quadrant to prevent any possibility of pulling lever past the centre. In case there is any doubt as to adjustment of lower die, you will stop car over first man-hole and make the necessary examination.

Brakes.

4. Gripmen must see that their brakes are kept oiled and in proper working condition. The automatic brake is for general use in making ordinary stops. Track brake on grip car and wedge brake on coach must not be used excepting in emergency to avoid accident.

Gripmen must be thoroughly familiar with the construction and operation of grip and brake.

Signals.

5. One tap of the bell given by the Conductor is signal to stop, repeated after a few seconds, to stop immediately. Two quick taps to start, and three taps to increase speed. Two quick taps by the Gripman is the signal for the Conductor to come to his assistance.

EMERGENCY SIGNAL.—Three quick taps by the Gripman is signal for Conductor to set rear brake at once.

Leaving Car.

6. No Gripman must leave his box while cable is in grip, except in care of his Conductor or another Gripman, or to render assistance in case of accident on the spot.

Starting Train.

7. Gripmen will not start until receiving signal from the Conductor,



A 3-car train descends the Selby Hill. Note the retaining wall, which remains in place today. Minnesota Historical Society collection.

and not then until sure no passenger is getting on or off grip car or front platform.

Gripmen will be careful to apply grip gradually, and not start train with a jerk.

They will also avoid the unpleasant sensation of having train apparently held back soon after starting. This can be done by loosening the hold on the cable for an instant.

Stopping Train.

8. In stopping at the usual places, Gripmen will apply the brake in such manner as will gradually bring the train to a stop, and avoid all jerking and surging. Upon receiving signal to stop it must be obeyed immediately. It is required that trains be stopped in such manner that the rear car shall not obstruct the cross street.

Train must always stop before reaching Summit avenue going down, and Pleasant avenue going up, and must not start until Brakeman has tested the brakes and given signal to go ahead. No train will stop between Summit avenue and Pleasant avenue at any time, except to avoid accident.

Time.

9. You will run on schedule time,

and by time tables. Leave terminals on time and avoid unnecessary delay in stopping for passengers. Any Gripman who is not able to run on schedule time, whether too slow or too fast, will not be retained.

No Gripman will be retained who runs his train faster or slower than the speed of the cable.

Dropping Cable.

10. When approaching place where cable is to be dropped, Gripmen must have train under complete control, so that if cable should not be free from grip, train can be stopped immediately. When one train is on the pick-up another will not make the run until the first is out of the way. Gripmen will bring their car to a full stop in the centre of the "throw off" at both terminals, and will not start until the cable is thrown from the grip.

If the "throw off" does not act, the cable must be thrown out with the hook.

Conductors and Gripmen are equally responsible for the exact fulfillment of this rule.

Disabled Grip.

11. In case a grip is disabled while drawing a car, the next train following will push it, and trains in this position must not move until coupled up. In all such cases the Gripman who is moving the train will not start until he receives two bells from both ends of the train.

Gripman of disabled grip will retain his place, sounding the gong, and, when necessary to stop, will give a tap of the bell (at the same time applying the brake) to the Conductor next behind him, who in turn will give one tap to Conductor of second car, if there are two, and so on until it reaches Gripman of pushing grip. In all such cases special care must be taken to



Selby at Summit Avenue, with the Kittson mansion occupying the future site of the Cathedral of St. Paul. Minnesota Historical Society collection.

avoid accidents, and no risks taken.

Sounding Gong.

12. Gripmen will in every instance sound the gong while approaching cross streets, also 50 feet before meeting a train and while passing it, and to

warn drivers and their vehicles off the track. In case any person is approaching, crossing or on the track, who does not seem to hear the gong, train must be brought under control to avoid danger. In passing churches during hours of service, there should be no unneces-

sary sounding of the gong.

Passengers will not be allowed to ring the gong. Gong must be kept ringing continuously during time train is on curves.

13. Gripmen must keep a sharp lookout for passengers, and stop train at proper places to receive them; at cross streets looking in each direction before starting.

Trains will stop to receive and discharge passengers at further crossing of intersecting streets.

No train will be stopped to receive or discharge passengers going in either direction, between Summit and Pleasant avenues. If for any reason train must be stopped on Selby avenue hill, you will in every instance let train down to bottom with the brakes before attempting to start up.

Crossing Streets.

When passing another train on a cross street, both trains will reduce speed and special care be taken to avoid accidents.

Switches.

In running over switches, cross tracks, castings, etc., move train slowly, except when greater speed becomes necessary.

16. Trains must not run in a bunch, and no excuse will be taken for trains being less than a block apart, except in case of disabled grip, at terminals or blockade.

Headway.

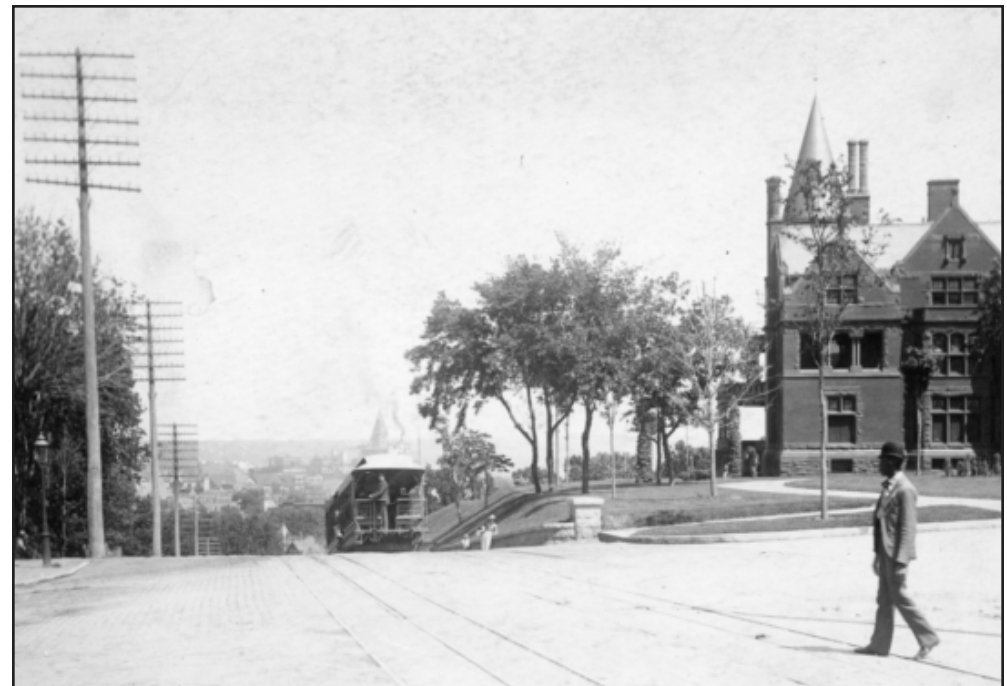
17. No train will approach nearer than 500 feet to the train ahead, except at end of routes, or in case of disabled grip or blockade, and then only upon the signal of the Conductor of the train ahead.

Dead Cable.

18. Whenever the cable stops running Gripmen must immediately loosen their hold on the rope, and in no case take hold again until the cable is well in motion. Should this occur on the Selby avenue hill, trains must be backed down the hill to starting point at Pleasant avenue. If train is heavily loaded, request passengers to alight until train is let down the hill. This applies to trains coming down the hill as well.

Horses.

19. Whenever it becomes necessary to move the train with horses, Gripmen will throw out the cable and close the grip. Before the car is moved by the horses Gripmen and



Above: An eastbound train leaves Summit Avenue and tips over the edge of the hill.
Below: In 1889, when the line only reached Dale Street, the cable cars ran every 5 minutes and it took 9 trains to cover the schedule.

TIME CARD.

The St. Paul City Railway Co.

SELBY AVENUE CABLE LINE.

LEAVE POWER HOUSE, SELBY AVENUE AND DALE STREET.

1	6.00	6.45	7.30	8.15	9.00	9.45	10.30	11.15	12.00	12.45	1.30	2.15	3.00	3.45	4.30	5.15	6.00	6.45	7.30	8.15	9.00	9.45	10.30	11.15	12.00	*
2	6.05	6.50	7.35	8.20	9.05	9.50	10.35	11.20	12.05	12.50	1.35	2.20	3.05	3.50	4.35	5.20	6.05	6.50	7.35	8.20	9.05	9.50	10.35	11.20	*	*
3	6.10	6.55	7.40	8.25	9.10	9.55	10.40	11.25	12.10	12.55	1.40	2.25	3.10	3.55	4.40	5.25	6.10	6.55	7.40	8.25	9.10	9.55	10.40	11.25	12.10	*
4	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	*
5	6.20	7.05	7.50	8.35	9.20	10.05	10.50	11.35	12.20	1.05	1.50	2.35	3.20	4.05	4.50	5.35	6.20	7.05	7.50	8.35	9.20	10.05	10.50	11.35	12.20	*
6	6.25	7.10	7.55	8.40	9.25	10.10	10.55	11.40	12.25	1.10	1.55	2.40	3.25	4.10	4.55	5.40	6.25	7.10	7.55	8.40	9.25	10.10	10.55	11.40	12.25	*
7	6.30	7.15	8.00	8.45	9.30	10.15	11.00	11.45	12.30	1.15	2.00	2.45	3.30	4.15	5.00	5.45	6.30	7.15	8.00	8.45	9.30	10.15	11.00	11.45	12.30	*
8	6.35	7.20	8.05	8.50	9.35	10.20	11.05	11.50	12.35	1.20	2.05	2.50	3.35	4.20	5.05	5.50	6.35	7.20	8.05	8.50	9.35	10.20	11.05	11.50	12.35	*
9	6.40	7.25	8.10	8.55	9.40	10.25	11.10	11.55	12.40	1.25	2.10	2.55	3.40	4.25	5.10	5.55	6.40	7.25	8.10	8.55	9.40	10.25	11.10	11.55	12.40	*

LEAVE FOURTH AND BROADWAY.

1	6.20	7.05	7.50	8.35	9.20	10.05	10.50	11.35	12.20	1.05	1.50	2.35	3.20	4.05	4.50	5.35	6.20	7.05	7.50	8.35	9.20	10.05	10.50	11.35	12.20	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
2	6.25	7.10	7.55	8.40	9.25	10.10	10.55	11.40	12.25	1.10	1.55	2.40	3.25	4.10	4.55	5.40	6.25	7.10	7.55	8.40	9.25	10.10	10.55	11.40	12.25	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
3	6.30	7.15	8.00	8.45	9.30	10.15	11.00	11.45	12.30	1.15	2.00	2.45	3.30	4.15	5.00	5.45	6.30	7.15	8.00	8.45	9.30	10.15	11.00	11.45	12.30	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
4	6.35	7.20	8.05	8.50	9.35	10.20	11.05	11.50	12.35	1.20	2.05	2.50	3.35	4.20	5.05	5.50	6.35	7.20	8.05	8.50	9.35	10.20	11.05	11.50	12.35	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
5	6.40	7.25	8.10	8.55	9.40	10.25	11.10	11.55	12.40	1.25	2.10	2.55	3.40	4.25	5.10	5.55	6.40	7.25	8.10	8.55	9.40	10.25	11.10	11.55	12.40	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
6	6.45	7.30	8.15	9.00	9.45	10.30	11.15	12.00	12.45	1.30	2.15	3.00	3.45	4.30	5.15	6.00	6.45	7.30	8.15	9.00	9.45	10.30	11.15	12.00	12.45	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
7	6.50	7.35	8.20	9.05	9.50	10.35	11.20	12.05	12.50	1.35	2.20	3.05	3.50	4.35	5.20	6.05	6.50	7.35	8.20	9.05	9.50	10.35	11.20	12.05	12.50	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
8	6.55	7.40	8.25	9.10	9.55	10.40	11.25	12.10	12.55	1.40	2.25	3.10	3.55	4.40	5.25	6.10	6.55	7.40	8.25	9.10	9.55	10.40	11.25	12.10	12.55	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
9	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15	1.00	1.45	2.30	3.15	4.00	4.45	5.30	6.15	7.00	7.45	8.30	9.15	10.00	10.45	11.30	12.15



The E. 7th Street cable line only lasted 4 years, as opposed to 10 years for the Selby line. This is the only known photo. It shows the downtown terminus on 7th Street at Wabasha. Note that there is no cable slot for the right hand (eastbound) track on this side of the switch. You're looking downhill and cars switching tracks used gravity to coast through the crossover. Minnesota Historical Society collection.

Conductors will examine channel carefully and be positive there is no kink which would catch the grip.

Cable Running Backwards.

20. In case cable is moved backwards, Gripmen will open grip and allow cable to pass through, but not throw it out, nor take hold again until cable has attained regular speed in forward direction.

Avoiding Accidents.

21. A sharp lookout must be kept to avoid running into pedestrians and vehicles, especially at corners and cross streets. Passengers must never sit on front dash of grip car, or stand in front of Gripman; and the cross chain of front dash must be kept hooked up.

While the train is in motion the responsibility for safe running rests with the Gripmen, who will never allow any unauthorized person to handle the levers or ride in the space pro-

vided to work them.

Gripmen will be held responsible for any damage arising from negligence on their part, and will be required to pay \$50 to the Company, to be held with wages, as security for the same.

Children must not be allowed to ride on the foot board of grip cars.

No links or brake chains will be coupled or uncoupled while the train is in motion, but, to avoid accidents, trains will be stopped until proper connections are made. In passing excavations under or alongside the track, use due caution to avoid accident to workmen.

Reporting Damage.

22. A blank book will be kept on counter in Foreman's office, in which you will report all defects you may find in grip or grip car during your run; also, all mechanical defects in roadway must be reported in book on Roadmaster's counter. Make your notations full and complete, giving number of car, location of defect, etc. All damage to car, no matter of how slight a nature, caused by collision with vehicles or otherwise, must be reported on accident blank to Superintendent at once.

Trip Reports.

23. Gripmen are required to sign trip report made by Conductors, showing car numbers and number of trips run during the day.

Workmen on Track.

24. When approaching track upon which workmen are at work, Gripmen must sound the gong, have train under complete control, and keep a sharp lookout.

Special care must be taken in the case of employees working in or about man-holes.

Man-Holes.

25. Should any man-hole cover be discovered missing or in a dangerous condition, the fact must be reported to the Superintendent's office as soon as possible.

Employees working along the track nearest to the dangerous man-holes, when notified by Gripmen, are instructed to proceed at once to said place and guard it until relieved.

Should through any means a man-hole cover become loosened and lifted, and caught between fender and grip, the train should be stopped at once.

Remove the first man-hole cover ahead of train, and move train slowly until the loose cover is over the man-hole, when it can be easily placed in position, and allow the fenders to clear it. Both covers must then be placed in original position.

Headlights.

26. Headlights must not be allowed to smoke.

General Rules.

27. You are required to make yourself familiar with the Conductors' and General "Rules" in this book.

Brakemen.

28. The position of Brakemen on Selby hill, between Pleasant avenue and Summit avenue, will be on the front platform of coach. Always stand on front platform of coach with your hand on brake staff.

In going down the grade you will steady train down with handbrake, being careful not to slide the wheels. Remember that if you apply the hand brake so that the wheels are sliding, and then apply the wedge brake, it will not act, as the wheels must be revolving in order to run on top of wedge and make it effective.

Gripmen will not apply automatic brake, but will keep one hand on track brake lever, ready to apply it in case of emergency.

Before starting on ascent or descent of hill, you will thoroughly test both brakes on coach and see that they are in perfect working order. When satisfied that brakes are in proper condition, give necessary signal to Conductor to go ahead.

Conductor Rules

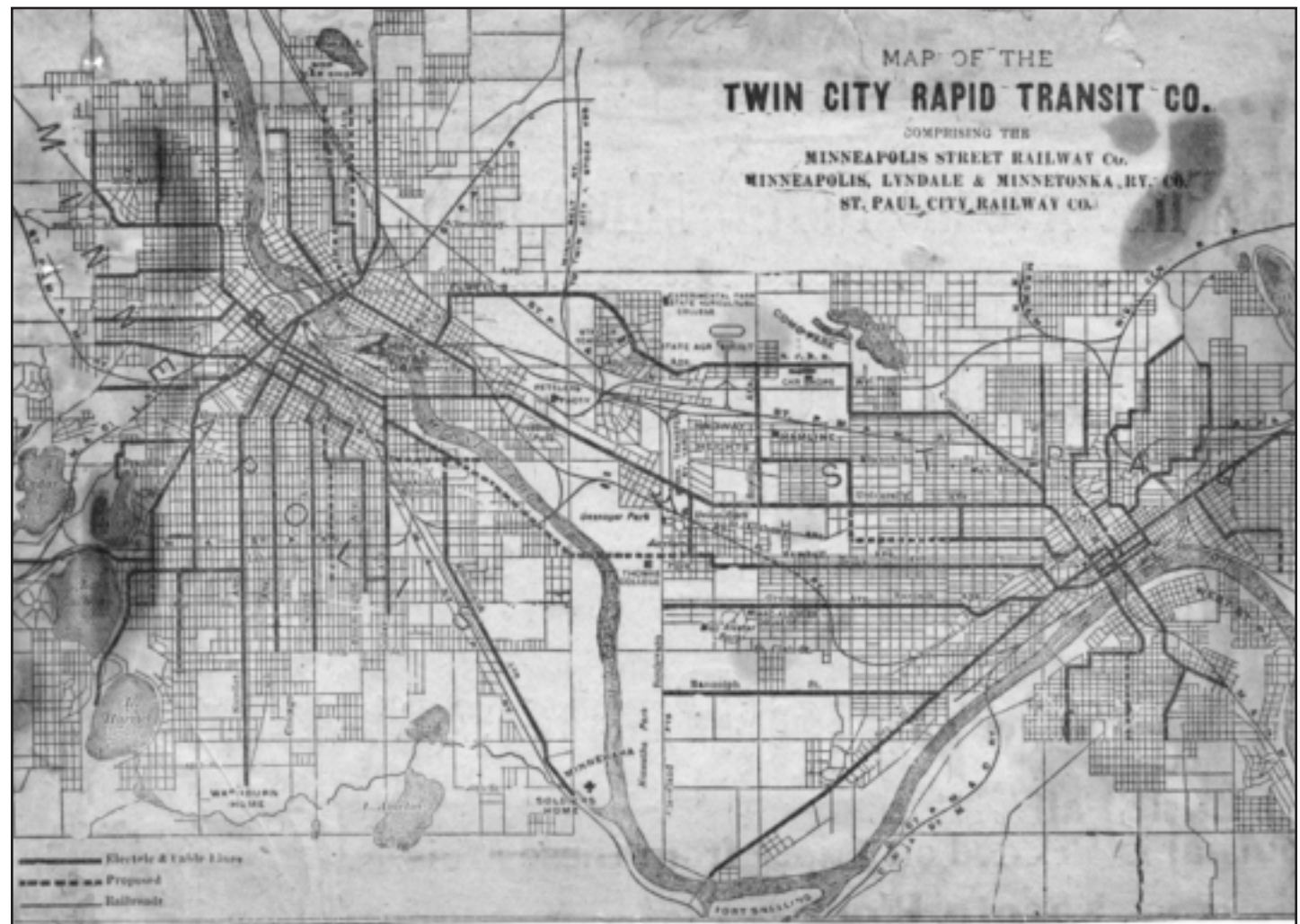
The section of the rulebook on conductors contains a number of rules specific to cable car operation. Remember that these were the first two-car trains operated by St. Paul City Railway, which opened up new operating situations. Following railroad practice, the conductor was the boss of the train.

Speed.

14. You will keep on time as nearly as possible, and see that Gripmen properly perform their duties; that they move their cars slowly around all curves, over all switches and across all tracks which intersect the route of this railway. You will not permit your Gripman to approach nearer than one block to any car, and should the car in advance be loafing or loitering behind time, they will report such car to the Superintendent at once. If any Gripman shall at any time attempt to diminish the receipts of any Conductor by increasing speed of the car, or not promptly stopping the car for passengers upon the signal by the Conductor, or shall directly or indirectly harass any Conductor, or be guilty of any misconduct, the Conductor shall report the same at once to the Superintendent.

Signals.

15. One tap of the bell given by



Conductor is signal to stop, repeated after a few seconds, to stop immediately; two quick taps to start, and three taps to increase speed. The Gripman will give one tap of the bell for each person getting on grip car. Two quick taps by the Gripman is the signal for the Conductor to come to his assistance. Three quick taps by the Gripman is the signal for the Conductor to set rear brake at once.

They will report all Gripmen who disobey signals of the bell, and will assist Gripmen in all cases when necessity demands.

Selby Avenue Hill.

16. Brakemen will take all cars up and down the Selby avenue hill, and are required to thoroughly test brakes before starting. Do not give signal to Gripman to "go ahead" either on ascent or descent until you receive signal from Brakeman that brakes are in proper condition.

You will remain on rear platform between Summit avenue and Pleasant avenue, and not enter car to collect fares, but keep a lookout for the safety of your passengers and hold yourself

The streetcar system looked like this in about 1898. It's interesting to see the proposed lines. Some were built, some weren't. The Selby-Lake line wasn't even on the radar. The proposal was another interurban connecting the two downtowns, using West River Road in Minneapolis. Other lines never built were on Hamline Avenue from Rondo to University, 11th Avenue S., Washington Street NE and Monroe Street NE.

in readiness to render all assistance possible in case of accident.

Switches.

17. Conductors will be held responsible for the condition of switches, if not right, when they give signal to Gripman. This applies to all switches, whether operated by Switchmen or not.

Gripmen will not pass grip car over any switch until the same is examined by Conductor, and signal given to advance.

21. Gripmen will be under the direction of the Conductor who has charge of car, and who will be held responsible for any neglect or misconduct of his Gripman which he fails to report to the Superintendent.

Open Cars.

23. Conductors will take special pains to seat passengers on grip cars, and, when necessary, get off and point out seats to passengers who may desire to ride but think car is crowded.

Leaders.

24. Whenever there is more than one passenger car (*trailer*) in a train, Conductors of all cars will report on trip sheet the number of car next ahead of their car, and of grip car, with leaving time.

This applies also to "double headers" and to horse cars which are attached to cable trains. Conductor of grip car will report numbers of all cars drawn by his grip car.

Disabled Grip.

28. In case a grip is disabled while drawing a car, the next train following will push it. In all such cases the Gripman of the grip which is moving the train will not start until he receives

two bells from both ends of the train. Gripman of disabled grip will retain his place on grip car, sounding his gong, and when necessary to stop, will give tap of the bell (at the same time applying brakes), to Conductor next behind him, who, in turn, will give one tap to Conductor of second car (if there are two), and so on until it reaches Gripman of pushing grip. In all such cases special care must be taken and no risks incurred.

Running the cable cars

Running a cable car was very different than an electric streetcar. If you've ridden them in San Francisco you know what I mean. You can hear the moving cable slapping under the street. San Francisco has double-trucked single cars. The Selby Avenue line in St. Paul had a single trucked open grip car pulling a single truck trailer (or sometimes two), which would be open or closed depending on the season.

The gripman stood in an aisle in the center of the car with passenger seats on either side. In front of him a pair of long handles protruded from the floor, the grip lever and the track brake lever. There was also a foot brake pedal he could stand on.

Let's take an imaginary round trip from the terminal at 4th and Broadway to Selby and Chatsworth and back. The conductor gives two quick bells. The gripman pulls back on the grip lever while releasing the foot brake. The cable, or rope as it was sometimes called, is moving at 8 mph. To avoid a jerky start, the gripman gradually engages the cable. As he pulls back the lever, the grip starts to close on the cable, not tightly, but enough to set the car in motion as the cable slides through the grip. He gradually grips it tighter and the speed picks up until

full speed is achieved.

The conductor is stationed on the rear platform of the trailer, where he can keep an eye on the entire train. The gripman will stop for any waiting passenger. If someone on board wants to get off, the conductor gives a single bell for the train to stop at the next intersection. Stopping is a simple matter of relaxing the grip on the cable and deploying the foot brake.

Company rules call for the gripman to ring his gong continuously as he approaches every intersection and also when meeting opposing trains. 4th Street runs gradually uphill, with a short, somewhat steeper grade at Wabasha Street. When stopping for passengers here, the gripman will stand on the brake to hold the train on the hill while boarding takes place. Then it's a balancing act to engage the cable while releasing the brake, so the train doesn't roll backwards or jerk forward.

The cable train crosses horse car lines at Robert Street, Wabasha Street and 7 Corners. Company rules give the right of way to the cable cars. That's particularly important from 7 Corners to St. Peter Street, because the track curves slightly at four intersections. These were known as "pull curves". Once into the curve the grip could not release the cable, and the train could not stop. The gripman was required make sure the curve was clear and ring his gong continuously until out of the curve.

Two blocks beyond 7 Corners was Pleasant Avenue, where I-35E is today. This is the base of the hill up to Selby Avenue. A hill brakeman is waiting and the train comes to a stop. The brakeman tests the grip car's track brake and the trailer's wedge brake, also called a slot brake. This is the same type of brake as the track brake on the grip car. If an emergency stop is

required, the wedge brake and grip car track brake jam down into the cable slot and stop the train immediately. It's a pretty drastic remedy and usually causes some damage, but it will prevent a runaway. That's why on San Francisco cable cars the emergency brake lever is painted red, so it's harder to pull it accidentally.

The gripman starts the train and really tightens the grip's hold on the cable, so there will be no slippage. The brakeman rides up the hill. At the top, the intersection of Summit Avenue, the brakeman alights to wait for the next downhill train.

West of Summit, Selby Avenue is fairly level. At Dale Street it passes the carbarn/power house. This is where the cable to downtown ends and the second one to Chatsworth starts. The gripman has to release the first cable, coast over the gap and engage the second one, which runs faster at 12 mph.

At the Chatsworth end of the line, the trailer is detached and manually pushed through a crossover onto the eastbound track. The grip car, having released the cable, is manually pushed onto the eastbound track via a different crossover, so it's now ahead of the trailer. The trailer is then pushed forward and coupled to the grip car. During the switching the conductor stands on the trailer's front platform to direct the moves.

The trip back down Selby Avenue is the same until Summit Avenue, the top of the steep grade. There is a mandatory safety stop. The waiting brakeman tests the brakes. As the train eases down the hill, the conductor tightens down the trailer's rear brake wheel and the brakeman does the same on the trailer's front platform. It should be noted that on the steep hill the brakeman instructs the gripman and conductor when to apply the emergency track and wedge brakes. At

Pleasant Avenue the brakeman departs.

We have a booklet that contains Special Notices advising the cable car crews of the operating rules. It also admonishes them to avoid taking unsafe shortcuts. For example, one Special Notice tells the Selby Hill brakemen not to jump from a moving downhill train to a moving uphill train when they pass each other. They were supposed to stay with their train to the bottom of the hill, wait until it stopped, then board the uphill train.

Another Special Notice warns gripmen not to exceed the speed of the cable. This could be done by releasing the cable when traveling downhill and coasting faster than the cable speed. This was more likely to happen on the eastbound trip, which was generally more downhill.

After clanging through the pull curves at 7 Corners, Washington Street, Market Street and St. Peter Street, the round trip ends at 4th and Broadway. Once again the train is manually switched to the westbound track, and the trailer is uncoupled and maneuvered behind the grip car for the next trip up the hill.

Replacing the cable

Cable cars worked, but the technology was cumbersome. Cables wore out, starting with strands that snapped and began to snag whatever they passed. In 1889 the Minneapolis Tribune described how a cable was replaced after 14 months of use.

At 1 o'clock yesterday morning the old cable was cut at Broadway Street and the end of the new cable was spliced on. The engine at the power house was started, pulling through the new line. The old cable was again cut at the power house and a grip car, to which were attached six horses, pulled out the line, while a force of 40 men reeled it up at Broadway as fast as it was

taken out. The grip car stopped at Wabasha Street and the remainder of the 80,000-pound line pulled through by hand, one half being out at noon. Stationed along the route, in man-holes, were a large number of men who watched the new line as it was pulled through and prevented any doubling or obstructions on curves.

The work was very difficult and occupied a much longer time than was anticipated.

The old cable was in a more damaged condition than was at first thought, breaks in single strands at intervals of every few inches.

Accidents

The Selby cable line had only been open for a week when it suffered a fatal accident on the hill. Here's how the local paper described it, slightly edited.

For months a topic of vivid local interest has been when the St. Anthony Hill line of cable cars would be opened, the horse cars being quite inadequate to supply the rapidly increasing population. Snows have covered the tracks and numerous accidents have caused repeated postponements, but today the cars began to run with some regularity and the public was allowed to make use of them and a most serious accident signaled the occasion.

About half way up the Third Street hill the line turns into Selby Avenue at an obtuse angle, and from this curve to the top of the hill the grade is steeper.

At half past one this afternoon, a grip and passenger car, both heavily loaded with passengers, started down the hill. It was in the charge of Conductor North and Gripman Johnson. The grip had been inspected before it left the end of the line and seemed in perfect order, but about midway down the hill the grip failed to hold the thread and the train rushed down to the curve, reaching which it had attained a speed of 20 miles an hour.

The grip car did not leave the track, but the passenger coach whirled off and turned over and was dragged some distance. Many of the passengers jumped off, but a majority of those in the closed car could not do so and all of them, twenty or more, were more or less hurt.

Gripman Johnson says, "We were about halfway down Selby Avenue hill when the cars began to slide. The grip slipped. I don't know why. I did my best to stop the cars, and threw my weight on the grip, but could not hold the cars. At the curve the cars went off and rolled over and over." When he found the grip slipping he called to the conductor but that person was too busy collecting (fares) to help him.

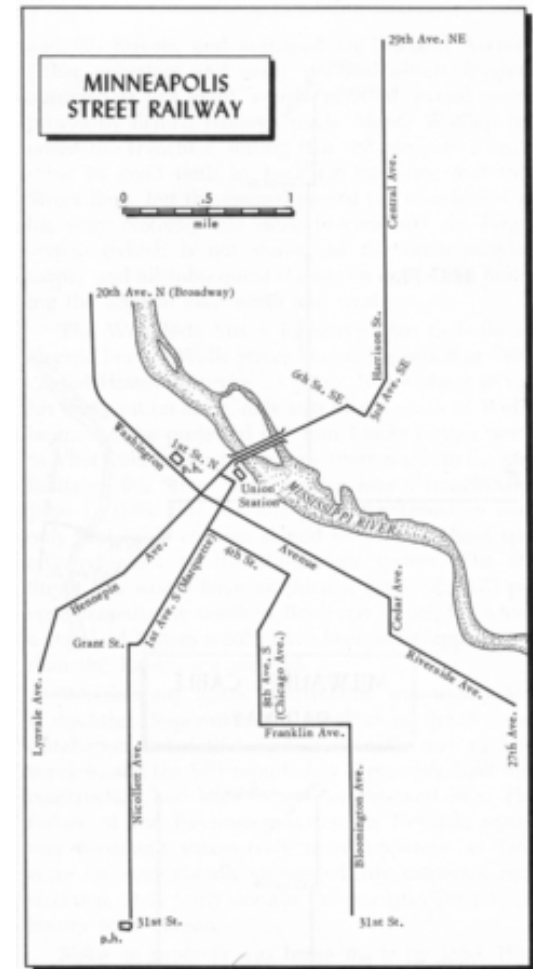
The fatality was a man flung against a tree. A boy had his left hand torn off at the wrist. A woman was pressed against the car stove and badly burned. A dozen other passengers received lesser injuries.

From the news account it sounds like the crew failed to follow the rules. The gripman and conductor failed to use the track and wedge brakes. The conductor was collecting fares instead of manning the brake wheel on the rear platform.

There was a second accident in December 1896. A three-car train had almost reached the top of the hill when the cable began to slip. The gripman set the track brake and most of the passengers alighted. Then the train began sliding down the hill and near the bottom it collided with an uphill train, carrying 100 passengers on its three cars. There were numerous injuries but no fatalities.

The stillborn Minneapolis cables

It's well known that when one of the Twin Cities acquires a new asset, the other feels it must do the same. This applied to cable cars, even though



Minneapolis mostly lacks steep hills. Over Thomas Lowry's objections, the Minneapolis City Council demanded a 21-mile system radiating in six directions from downtown, shown above.

Two powerhouses were actually built in late 1889, on 3rd Avenue N. at 2nd Street, and at 31st and Nicollet as part of 31st Street Station. While this was happening, however, in June 1889 the independent Stillwater Street Railway brought the Sprague electric car patents to the Twin Cities metro area when they could be seen by any-



The newly constructed powerhouse for Minneapolis cablecars is clearly visible in the rear of the TCRT carhouse at 3rd Avenue N. and 2nd Street. The building stands today.

one. Lowry was able to persuade the City Council to let him electrify the 4th Avenue S. line in late 1889 and it succeeded. That was the end for cable cars in Minneapolis. In August 1890 the City Council reversed itself and voted in favor of an all-electric system.

The two powerhouses were used for electric cars instead. The 3rd Avenue N. building survives to this day. TCRT went into debt to build the cable lines and didn't pay off the bonds until 1947.

The counterweight

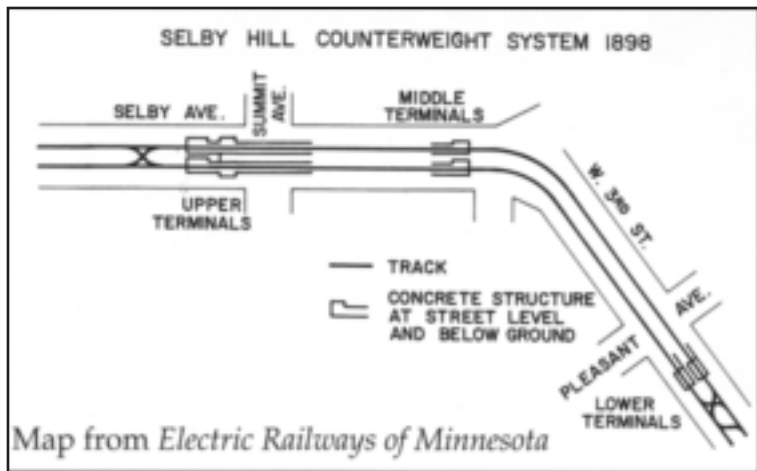
After electrification, the counterweight allowed electric streetcars to navigate the 16 percent grade up to Selby Avenue, normally beyond the capabilities of steel wheel on steel rail adhesion.

The counterweight track extended 683 feet from just west of Summit Avenue to just east of the intersection of 3rd Street (now Kellogg Blvd.) and Pleasant Avenue (location of I-35E



Above: The top end of the counterweight, just west of Summit Avenue. Hennepin County Historical Society collection.

Below: The bottom end of the counterweight at Pleasant Avenue. Minnesota Historical Society collection



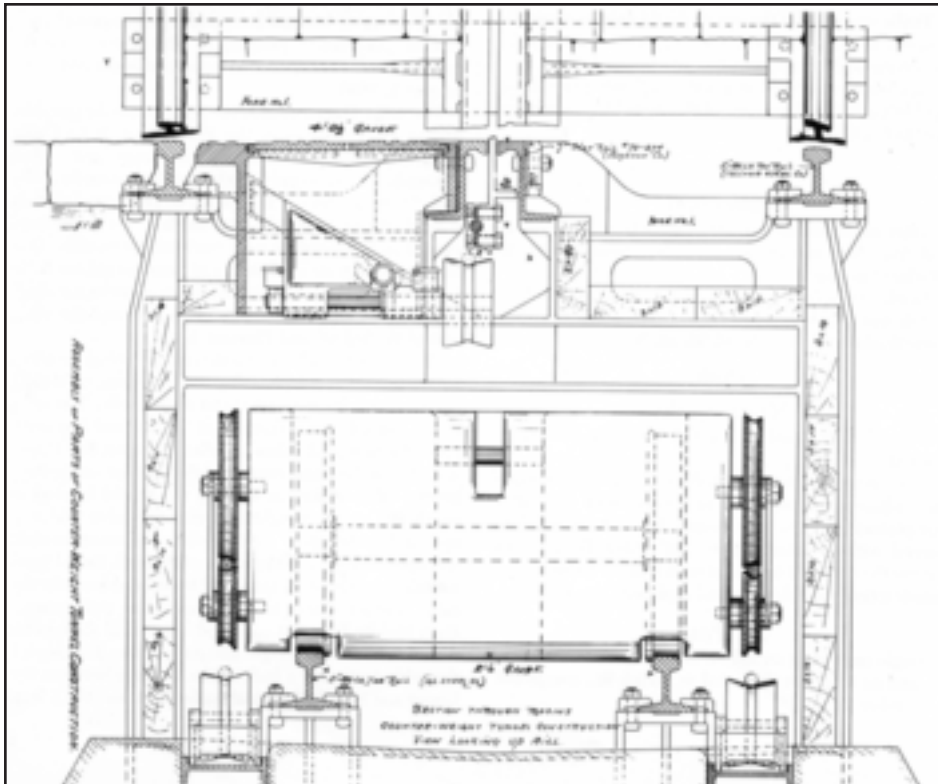


today). The thing to remember is that the counterweight was no longer powered by a stationary steam engine. Instead, the tracks up and down the hill were rebuilt with a tunnel underneath each one. Rolling on a narrow gauge track in each tunnel was a rolling counterweight attached to a cable. Unlike the Duluth incline, where the two cars balanced each other, on Selby Hill each track could be operated independently.

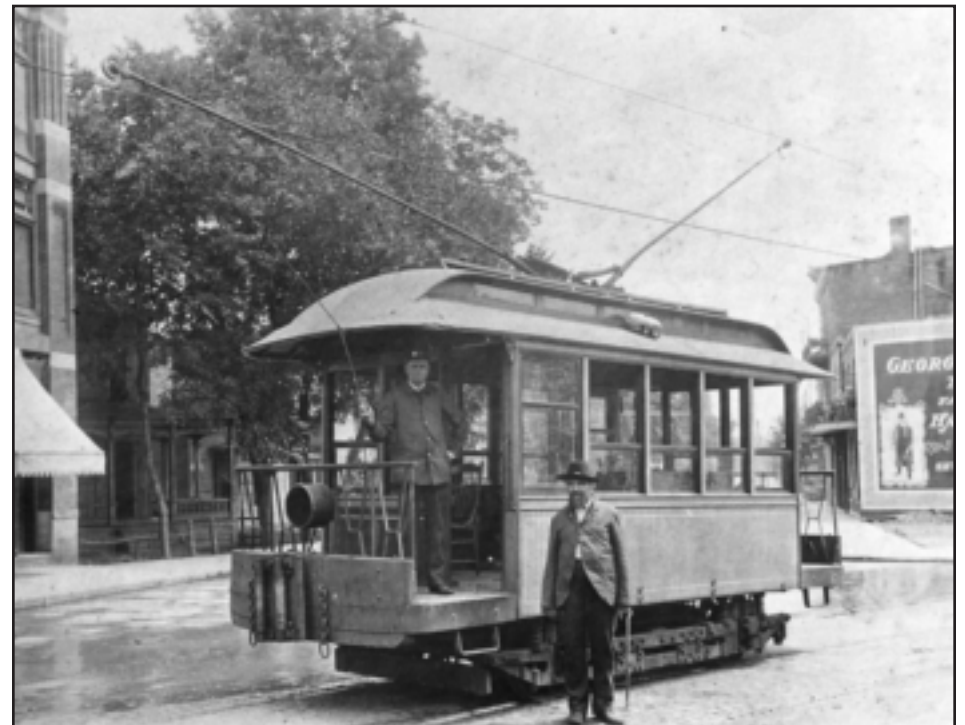
Three of the cable cars were rebuilt. They were equipped with a grip to grab the cable, but also had trolley poles and motors so they could operate like a normal streetcar. Assisted by the underground cable and counter-

weight, their job was to push streetcars up the hill and ease them down.

Here's how it worked. There were crossover tracks at the bottom and top of the hill. The counterweight car at the bottom of the hill would sit on the eastbound track until a westbound streetcar approached. The streetcar would clear the crossover, the counterweight car would back through the crossover, then ease forward until its rounded bumper contacted the rear of the streetcar, and it would grab the cable. The counterweight car and the streetcar would both accelerate using their motors, while the underground counterweight helped them up the hill. At the top the streetcar would con-



Above left: The counterweight at work, pushing a streetcar up the hill.
Below left: A cross section showing the counterweight riding narrow gauge rails underneath the streetcar tracks. You can see the grip and the round cable.
Below: One of the counterweight cars waits at the bottom of the hill.



tinue on its way and the counterweight car would drop back down the hill to wait for the next westbound.

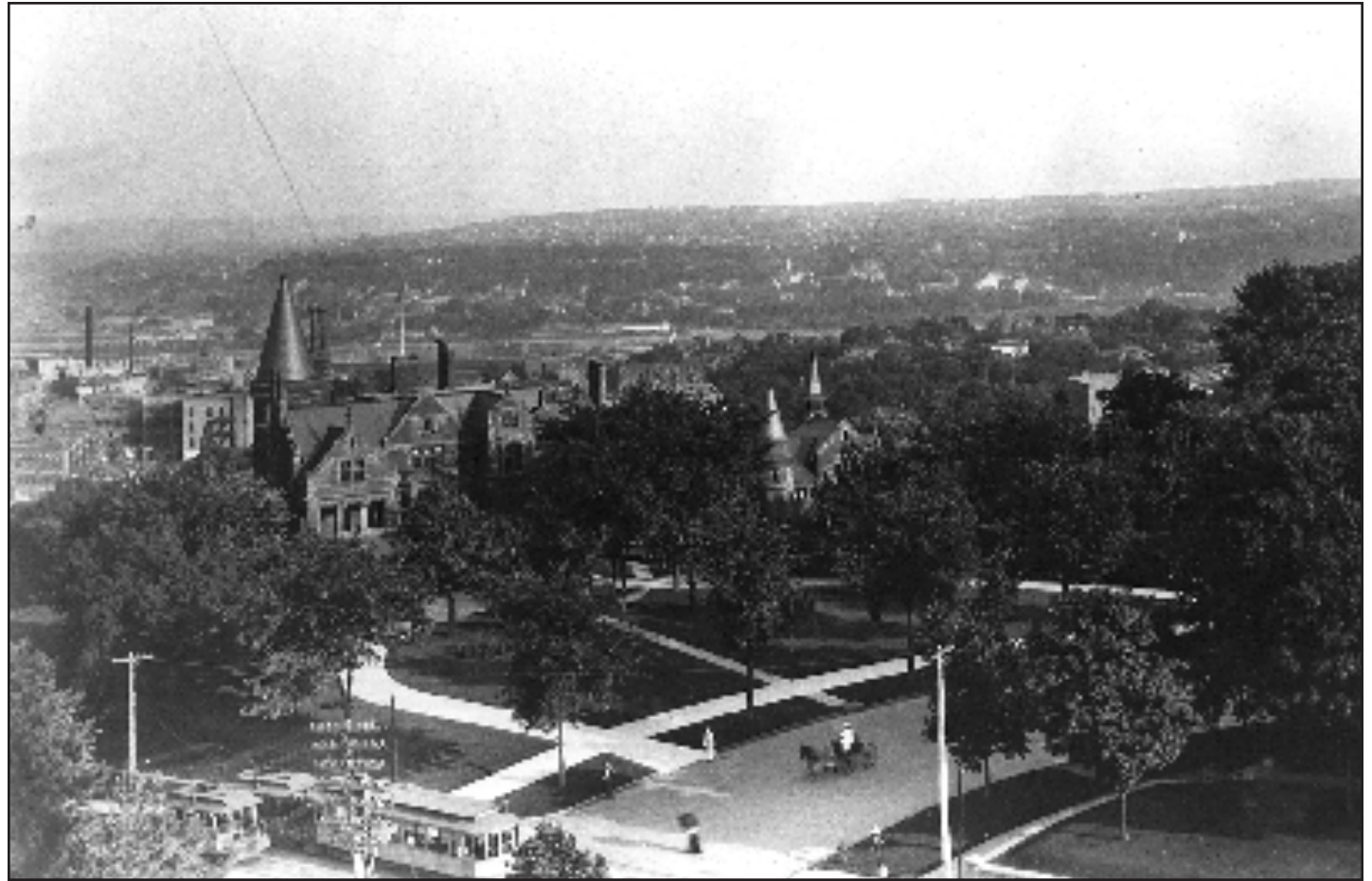
The eastbound downhill movement worked the same, only in reverse. The streetcar eased up to the waiting downhill counterweight car, which led it down the hill. At the bottom of the hill the counterweight car used the crossover to get out of the way, the streetcar continued into downtown, and the counterweight car climbed the hill to wait for the next eastbound.

At least we think that was the way it worked. We have two photos, both published here, that show cars ascending and descending on the wrong track. That implies some operational flexibility to do whatever was fastest and easiest.

While this system worked, it was cumbersome, slow and cost extra money. In 1906 the Selby Line was extended west across the new Mississippi River bridge to connect end-to-end with the Lake Street line to form the Selby-Lake. Ridership dramatically increased and TCRT decided to conquer the hill once and for all. The new 1500-foot Selby Tunnel reduced the grade from 16 percent to 7 percent. During construction the Selby-Lake cars detoured via the parallel Rondo Avenue line using temporary track on Farrington Street. The tunnel opened on August 11, 1907.

The three counterweight cars were rebuilt and assigned as shop shifters at the new Snelling Shops. They lasted until the end of service, the oldest rolling stock on the property.

Here are two examples of a counterweight car pushing a streetcar up the "wrong" track. Top: At Summit Avenue, viewed from the Kittson mansion. Minnesota Historical Society collection. Bottom: A rare side view of the up and down cars passing one another.



Duluth's Trolley Buses

-Aaron Isaacs

As automotive technology began to take hold in the early 1900s, the method of propulsion was contested for awhile. Gasoline engines were the most popular solution, but manufacturers flirted with steam and batteries. Neither was successful and they were soon abandoned.

The first buses appeared during World War I. Being larger, they needed more horsepower than autos, yet they ran on fixed routes like streetcars. By this time the electric technology that powered streetcars was sophisticated, reliable and off the shelf. It provided plenty of horsepower, superior acceleration and no fumes. Why not try to power a bus from overhead wires?

There were three pioneering installations during the 1911-1920 period, all short lived. A wave of experimental lines opened in a dozen cities in 1921-22, including the brief 1922 Minneapolis test on Bloomington Avenue (see page 20). It was not until 1923 that the first permanent trolley bus line opened in Philadelphia. This was spurred by local manufacturer Brill, the largest maker of streetcars, promoting their recently developed Railless Car.

A few small trolley bus lines were built during the rest of the 1920s, but it was the Great Depression of the 1930s when the technology began to take off. The combination of a terrible economy and auto competition cut transit ridership in half. Streetcar lines began to disappear in large numbers. Gas buses were too small to replace streetcars on a one for one basis, but trolley buses, with a superior power source, grew large enough to carry 40 passengers. Streetcar companies were familiar with electric power and much of the

infrastructure (power generation, substations, overhead wire poles and span wires) was already in place. All that was needed was to add a second overhead wire and re-hang the original trolley wire with different fittings required for trolley bus poles. There were the added benefits that trolley buses emitted no exhaust fumes and could pull over to the curb, making passenger boarding safer and removing an obstacle to auto traffic.

By 1939 there were 2184 trolley buses running in the US. That number would peak at 6500 in 1950. To put that in perspective, in 1950 there were still 12,200 streetcars and 56,800 motor buses. Not including the short-lived experimental lines, trolley buses ran in 70 North American cities. Examples relatively near the Twin Cities included Milwaukee, Des Moines, Winnipeg, Thunder Bay and, of course, Duluth.

Trolley buses come to Duluth

Duluth Street Railway was in bad shape financially and was forced into receivership in 1930. It was reorganized as the Duluth-Superior Transit Company in 1933. Cutting expenses and avoiding major future expense were the priorities. Streetcar track wears out and replacing it is a large investment, so DST decided to replace streetcars with trolley buses when the track wore out.

The Park Point line, having probably the worst track in the system, was initially the first candidate for trolley bus conversion. However, when Park Point was converted to bus in 1931, gas buses were used. This may have been because streetcars frequently derailed crossing the Aerial Bridge, a potential disaster if a lake boat was approaching and the bridge had to be raised.

Instead, on October 4, 1931 the first trolley buses replaced the eastern end



Above: One of the great advantages of trolley buses was their ability to pull over to the curb, unlike streetcars which blocked traffic lane. This is Superior Street in downtown. Illinois Railway Museum collection.

Below: Trolley buses fill the yard at 27th Ave. W. and Superior Street.





Left: Crossing the Lester River bridge on Superior Street, west of the terminal loop. Right: The Grand Avenue line turned from Superior Street onto 21st Avenue W. Non-revenue wires extended left on Superior to the garage. This bus is probably changing drivers.

of the Lester Park streetcar line, which also had bad track. From the loop next to the Lester River at 61st Avenue E., they shuttled via Superior Street to a streetcar connection at 45th Avenue E., a distance of only 2 miles. A pair of Brill Model T40 trolley buses, numbered 1 and 2, provided the service.

Three years passed, and DST replaced the rest of the East Superior Street line with trolley buses on

August 5, 1934. It also converted the short Piedmont Avenue line west of downtown. That made sense because it was necessary to string trolley bus wire beyond downtown on West Superior Street to reach the carbarn at 27th Avenue W. Half of that distance could be used to reach Piedmont Avenue. There was only one additional mile required on Piedmont itself, and that featured some of the steepest

grades in Duluth and some single track with blind approaches to curves. Trolley buses climb steep hills with ease, so there was a side benefit.

To equip the new line, DST purchased 16 more trolley buses. Brill supplied seven more of the T40 model (40 seats), but with a different body than the first two. They were numbered 3-9. From Twin Coach they bought nine model 40TT (Trackless Trolley) buses,

also with 40 seats.

As the end of streetcars approached in 1939, DST had to decide whether to convert the remainder of the streetcars to trolley buses, gas buses or a mix of the two. Bear in mind that all the Superior lines, the Interstate, Park Point, Kenwood and the Gary-New Duluth line beyond Morgan Park had already been converted to gas bus. In our files is a copy of their study from December 1938 that costs out four scenarios. They were:

A: Trolley bus on Piedmont, Lester Park, Woodland at far as St. Paul Street in Hunters Park and West Duluth via Grand Avenue to 66th Avenue W.

B: Same as A, except trolley bus only to 61st Avenue W. and Grand, and gas buses configured differently.

C: Same as B, except all of Woodland line as trolley bus.

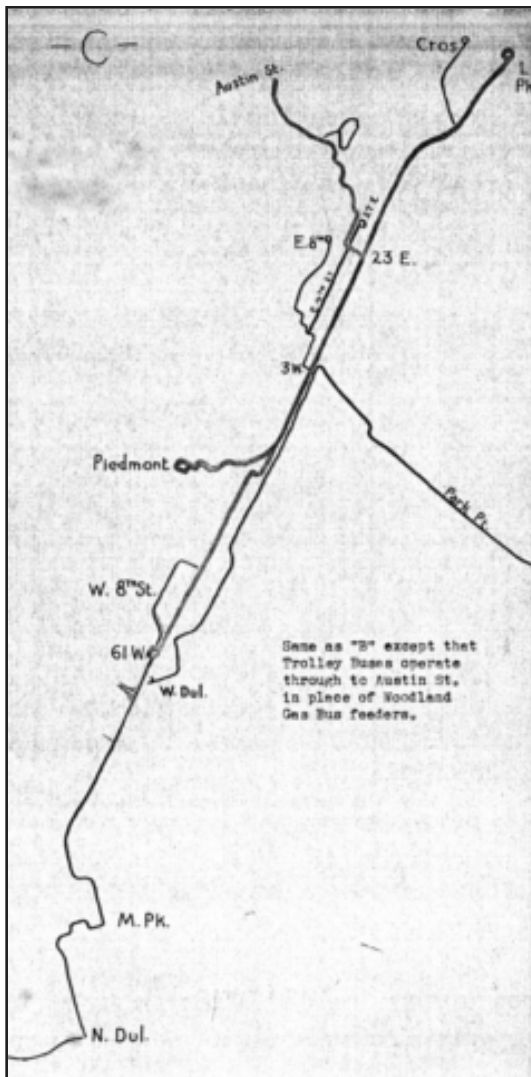
D: Same as C, except Woodland line routes via east 9th Street.

Four original DSR maps show the details of each plan, including the gas bus routes, which were divided between 23-passenger and 35-passenger buses.

The study took into account the capital cost for buses and overhead wire, and the operating cost. It also considered the convenience of passengers, especially where passengers would have to transfer from a shuttle bus to a mainline bus to reach their destinations.

Each plan required 10 additional trolley buses. Plans A and B required seven street miles of overhead wire. Plan C needed eight miles, because it covered the entire Woodland line, and Plan D needed 10 miles, because it added East 9th Street. Interestingly, all the scenarios moved the Woodland line from 24th Avenue E. to 23rd Avenue E.

The final plan was essentially Plan C, shortened on the Grand Avenue end



Above: Plan C from the trolleybus study was adopted with a couple of small changes. The thick lines are trolleybuses, the thin lines are gas buses.

Above right: One of the three big Pullman buses that arrived in 1944. Northeast Minnesota Historical Center collection.

Right: This bus doesn't appear on the trolley roster. It's a gas bus equipped with trolley poles for greasing the overhead wire. Northeast Minnesota Historical Center collection.



to 63rd Avenue W., and continuing to use 24th Avenue E.

Eleven additional trolley buses were purchased in 1939 from Brill, numbered 19-29. They were the newer Model SMT, also seating 40 passengers. Bus #29 was actually the SMT demonstrator, built in 1936.

Duluth ridership in 1940, the first full year of all-bus service, was 11.6 million passengers, 45 percent on trolley buses. As it did everywhere, ridership in Duluth grew during World War II. In 1946 it was 81 percent higher than in 1940. Trolley bus ridership increased by 16 percent.

To help carry the wartime passenger load, DST was able to procure a trio of 44-passenger Pullman-built trolley

buses in 1944, numbered 30-32.

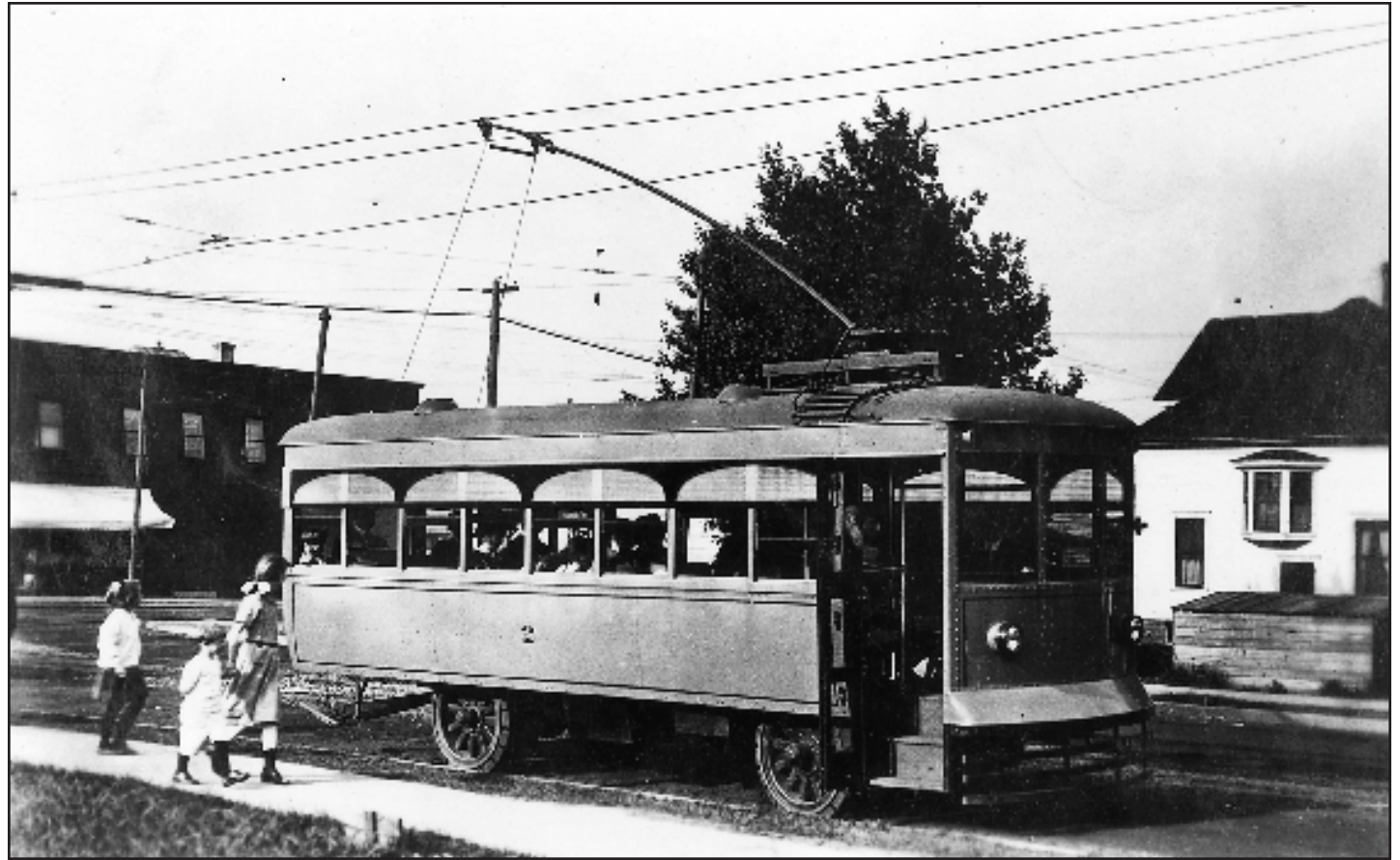
The trolley buses on Piedmont Avenue had been fed by a gas bus shuttle from Hermantown, forcing a transfer. This was clearly an opportunity to both cut costs while improving service, so the trolleys on Piedmont were discontinued in 1949 and Hermantown passengers now got a one-seat ride to downtown.

After the war, as it did everywhere, Duluth ridership dropped dramatically. By 1956, it was down to 8.8 million, less than half the wartime level. All across North America, transit operators were feeling the pinch of reduced revenues. Trolley buses cost more to run than motor buses because of the overhead wire and power generating costs. They were operationally inflexible, unable to detour around road construction. Riders who traveled beyond the end of the trolley bus line had to transfer to separate shuttle buses. This was a particular problem for those bound for Morgan Park, Gary and New Duluth, who had single seat rides during the streetcar era but now had to endure a transfer.

As in other cities, the trolley bus fleet was coming due for replacement, but now 51-passenger diesel buses were available. All these factors caused a wholesale conversion of 42 trolley bus systems to motor bus during the 1950s and 60s. June 6, 1957 was the last day of Duluth trolley buses.

The Minneapolis experiment

Trolley buses, or trackless trolleys as they were called then, were pretty new in 1922 when TCRT decided to give them a try. A single 30-passenger Railless Car was ordered from Brill. It was given the number 2, following gas bus #1, then running the shuttle between Camden and the end of the



2nd Street NE line at 30th and Grand Street.

The Bloomington Avenue streetcar line ended at 38th Street. Dual wires were strung from 38th Street to 48th Street and the trolley bus acted as a shuttle extension of the streetcar.

Startup was supposed to happen the first week of May 1922, but it was delayed for several days due to the need for overhead wire adjustments. Operations actually began on May 15, 1922, with the Brill bus making a round trip every 15 minutes.

Unlike future trolley buses, which had two trolley poles that tracked independently, #2 had a single pole

that ended in a fork supporting a pair of small trolley wheels.

There were two operational difficulties to overcome, turning the bus around at the ends of the line, and deadheading back to Lake Street Station.

The line was only 1.25 miles long, so the bus was reversing direction eight times each hour. How was that done? There were really only three alternatives:

1. Loop at each end.
2. Around the block at each end.
3. Wye at each end.

Only the wye option seems likely. That means the driver had to back

Brill Railless Car #2 initiated the Minneapolis experiment, seen here at 38th and Bloomington. MHS collection.

around the corner at each end of the line, then pull forward to finish turning around.

The deadhead trip to and from Lake Street Station was about 1.5 miles. No second overhead wire was strung. The bus driver had to place the positive trolley wheel on the streetcar wire. Negative contact with the rail was achieved with a spring loaded sliding shoe behind the right rear wheel. The driver kept the right wheels on the outside rail, so the shoe could follow



The combination of an unpaved streetcar and solid rubber tires produced a bone shaking ride, and caused TCRT to build a trolley bus of its own design, #3, seen below at Snelling Station.

Creek, CA, remembers riding the Bloomington Avenue trolley coach in 1922. 'The shaking and rattling were sufficiently strong to imprint themselves well upon my memory,' he related. 'Difficulties on the rough cinder road were so great that light bulbs shook out, and the rattan seat cushions flew up on particularly bad bumps'."

According to a newspaper story, TCRT was also dissatisfied with bus #2. In typical TCRT fashion, they decided to design and build their own. The result was bus #3, which entered

service in December 1922. Like #2, it had a single forked trolley pole, but used sliding shoes instead of trolley wheels. Its rail contact shoe was placed on the right side between the axles, instead of behind the rear wheel.

If #3 had proven successful, TCRT was prepared to open the new Lowry Avenue Crosstown with trolley buses. However, according to the paper, crossing the overhead of existing trolley lines was a problem to which they had not found an acceptable solution.

The Bloomington Avenue experiment ended on May 22, 1923. The streetcar tracks were extended to 48th Street and TCRT never did anything with trolley buses after that. According to Interurbans 14, both buses were stored until 1934, then scrapped.

and stay in contact with the rail. This must have been rather tricky during the turn at Lake and Bloomington, as well as entering and exiting the station yard.

Some on the city council rushed to embrace the trolley bus as the next big thing. Within a couple of months the council was suggesting using trackless trolleys for the 4th Avenue line extension from 38th to 48th. However, it was opposed by residents who probably wanted a one-seat ride on the more comfortable streetcars, which were extended in 1923.

There was a similar proposal to put trolley buses on Grand Avenue from 40th to 48th Street. This was actually approved by the city council, which then reversed itself in August 1922. The Grand extension was opened with streetcars in 1923.

The public wasn't happy with bus #2. This quote was found in the book, "Transit's Stepchild, The Trolley Coach".

"Eugene R. Boswell of Walnut





Above left: Builder photo of #3 at Snelling Shops.
 Above right: The driver's compartment. The driver steered with his left hand on that spinner handle while the right was on the controller.
 Below left: The interior was standard TCRT rattan seats.
 Below right: This is the only known photo of #3 in service.



Here are a couple of bonus Duluth photos. Bus #8, a 1934 Brill product, perhaps on Woodland Avenue. North East Minnesota History Center collection.

Duluth trolley bus #14 was part of a 9-bus order built by Twin Coach in 1934. Interestingly, it is posed on a street with no overhead wires.





MINNESOTA STREETCAR MUSEUM

PO Box 16509
Minneapolis, MN 55416-0509
www.TrolleyRide.org

August 2021

Pursuant to board action at the August 5, 2021 meeting of the board of directors and in honor of the 50th anniversary of operation of the Como-Harriet Streetcar Line the attached materials are being republished by the Minnesota Streetcar Museum under the under the Creative Commons "Attribution-ShareAlike 4.0 International" and "Attribution-ShareAlike 3.0 Unported" licenses. You may choose either license as suited for your needs. In particular, the 3.0 license is meant to be compatible with the Wikipedia project.

In general, these licenses will allow you to freely:

- **Share** — copy and redistribute the material in any medium or format
- **Adapt** — remix, transform, and build upon the material for any purpose, even commercially.

Under the following terms:

- **Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
 - **Please credit the *Minnesota Streetcar Museum* and provide our URL www.trolleyride.org** We would also appreciate hearing about your re-use of our materials though that is not a requirement of the license.
- **ShareAlike** — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.
- **No additional restrictions** — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.

No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

Please review these licenses at the Creative Commons site for full legal code and details on allowed uses:

- Creative Commons Attribution-ShareAlike 4.0 International:
 - <https://creativecommons.org/licenses/by-sa/4.0/legalcode>
- Creative Commons Attribution-ShareAlike 3.0 Unported
 - <https://creativecommons.org/licenses/by-sa/3.0/legalcode>

If these licenses are not appropriate for your needs, for example you want to use the material commercially without crediting us or do not want to share your contributions under the same license please reach out to us for other options.

We Make Minnesota's Electric Railway History Come Alive!